CLAIMS

The principles of this invention having been explained in accordance with the foregoing, we claim:

1. A method for producing a charged nonwoven filtration media which comprises the steps of

blending nonwoven fibers,

sheet forming the blend of fibers, and

applying a charge treatment to said sheets.

2. The method of claim 1 including, prior to said charge applying step, the steps of

multilayering a plurality of said sheets,

needle punching said plurality of sheets to bond them together.

3. The method of claim 1 wherein said blending step includes using polypropylene, polyester or other low melting temperature fibers in a blend to achieve enhanced thermal processing capabilities.

4. The method of claim 3 wherein said blending step comprises using 10-90% of polypropylene, including bi-component fibers, are used in a blend.

5. The method of claim 2 wherein the charge treatment applying step comprises applying a charged cationic or anionic resin to the bonded sheets.

6. The method of claim 5 wherein the applied cationic resin is polyamide-epichlorohydrin.

7. The method of claim 1 wherein the fabric density, air permeability, and mean pore size can be controlled through heated calendaring and densification of the bonded sheets, including smooth, textured, or patterned calendar rolls.

8. The method of claim 2 wherein the bonded sheets can be formed into flat or curved filter sheets, pleated filters, filter cartridges, filter bags, filter tubes, and the like.

9. A method for producing a charged multiple component, nonwoven filtration media which comprises the steps of

blending micro-denier/fine-denier blend fibers and fine-denier fibers,

sheet forming the blend of fibers,

multilayering a plurality of said sheets in a graded density structure,

needle punching said graded density structure to bond said sheets together, and

applying a charge treatment to said bonded sheets.

10. The method of claim 9 wherein said blending step includes using 10-90% of polypropylene or other low melting temperature fibers, including bi-component fibers, in a blend to achieve enhanced thermal processing capabilities.

11. The method of claim 9 wherein the charge applying step comprises applying a cationic or anionic resin to the bonded sheets.

12. The method of claim 11 wherein the applied cationic resin is polyamide-epichlorohydrin.

13. The method of claim 9 wherein the fabric density, air permeability, and mean pore size can be controlled through heated calendaring and densification of the bonded sheets, including smooth, textured, or patterned calendar rolls.

14. The method of claim 9 wherein the bonded sheets can be formed into flat or curved filter sheets, pleated filters, filter cartridges, filter bags, filter tubes, and the like.

15. A method for producing a charged multiple component, nonwoven filtration media which comprises the steps of

blending micro-denier/fine-denier blend fibers and coarse-denier fibers,

sheet forming the blend of fibers,

multilayering a plurality of said sheets in a graded density structure,

needle punching said graded density structure to bond said sheets together, and

applying a charge treatment to said bonded sheets.

16. The method of claim 15 wherein said blending step includes using 10-90% of polypropylene or other low melting temperature fibers, including bi-component fibers, in a blend to achieve enhanced thermal processing capabilities.

17. The method of claim 15 wherein the charge applying step comprises applying a cationic or anionic resin to the bonded sheets.

18. The method of claim 17 wherein the applied cationic resin is polyamide-epichlorohydrin.

19. The method of claim 15 wherein the fabric density, air permeability, and mean pore size can be controlled through heated calendaring and densification of the bonded sheets, including smooth, textured, or patterned calendar rolls.

20. The method of claim 15 wherein the bonded sheets can be formed into flat or curved filter sheets, pleated filters, filter cartridges, filter bags, filter tubes, and the like.

21. A method for producing a charged multiple component, nonwoven filtration media which comprises the steps of

blending micro-denier fibers and fine-denier fibers,

sheet forming the blend of fibers,

multilayering a plurality of said sheets in a graded density structure,

needle punching said graded density structure to bond said sheets together, and

applying a charge treatment to said bonded sheets.

22. The method of claim 21 wherein said blending step includes using 10-90% of polypropylene or other low melting temperature fibers, including bi-component fibers, in a blend to achieve enhanced thermal processing capabilities.

23. The method of claim 21 wherein the charge applying step comprises applying a cationic or anionic resin to the bonded sheets.

24. The method of claim 23 wherein the applied cationic resin is polyamide-epichlorohydrin.

25. The method of claim 21 wherein the fabric density, air permeability, and mean pore size can be controlled through heated calendaring and densification of the bonded sheets, including smooth, textured, or patterned calendar rolls.

26. The method of claim 21 wherein the bonded sheets can be formed into flat or curved filter sheets, pleated filters, filter cartridges, filter bags, filter tubes, and the like.

27. A method for producing a charged multiple component, nonwoven filtration media which comprises the steps of

blending micro-denier fibers and coarse-denier fibers,

sheet forming the blend of fibers,

multilayering a plurality of said sheets in a graded density structure,

needle punching said graded density structure to bond said sheets together, and

applying a charge treatment to said bonded sheets.

28. The method of claim 27 wherein said blending step includes using 10-90% of polypropylene or other low melting temperature fibers, including bi-component fibers, in a blend to achieve enhanced thermal processing capabilities.

29. The method of claim 27 wherein the charge applying step comprises applying a cationic or anionic resin to the bonded sheets.

30. The method of claim 29 wherein the applied cationic resin is polyamide-epichlorohydrin.

31. The method of claim 27 wherein the fabric density, air permeability, and mean pore size can be controlled through heated calendaring and densification of the bonded sheets, including smooth, textured, or patterned calendar rolls.

32. The method of claim 27 wherein the bonded sheets can be formed into flat or curved filter sheets, pleated filters, filter cartridges, filter bags, filter tubes, and the like.

33. A charged nonwoven filtration media which comprises

one or more sheets formed from blended nonwoven fibers, and

a charge treatment applied to said sheets.

34. The media of claim 33 wherein a plurality of said sheets are multilayered and needle punched to bond them together.

35. The media of claim 33 wherein said fibers are comprised of polypropylene, polyester or other low melting temperature fibers in a blend to achieve enhanced thermal processing capabilities.

36. The media of claim 33 wherein fibers of 10-90% of polypropylene, including bi-component fibers, are used in the blend.

37. The media of claim 33 wherein the charge treatment comprises a charged cationic or anionic resin.

38. The media of claim 37 wherein the cationic resin is polyamide-epichlorohydrin.

39. The media of claim 33 wherein the fabric density, air permeability, and mean pore size can be controlled through heated calendaring and densification of the bonded sheets, including smooth, textured, or patterned calendar rolls.

40. The media of claim 33 wherein the bonded sheets can be formed into flat or curved filter sheets, pleated filters, filter cartridges, filter bags, filter tubes, and the like.

41. A charged multiple component, nonwoven filtration media which comprises

a blend of micro-denier/fine-denier blend fibers and fine-denier fibers,

one or more sheets formed from the blend of fibers, said sheets being multilayered in a graded density structure and needle punched to bond said sheets together, and

a charge treatment applied to said bonded sheets.

42. The media of claim 41 wherein 10-90% of polypropylene or other low melting temperature fibers, including bi-component fibers, are used in the blend to achieve enhanced thermal processing capabilities.

43. The media of claim 41 wherein the charge applied is a cationic or anionic resin.

44. The media of claim 43 wherein the applied cationic resin is polyamide-epichlorohydrin.

45. The media of claim 41 wherein the fabric density, air permeability, and mean pore size can be controlled through heated calendaring and densification of the bonded sheets, including smooth, textured, or patterned calendar rolls.

46. The media of claim 41 wherein the bonded sheets can be formed into flat or curved filter sheets, pleated filters, filter cartridges, filter bags, filter tubes, and the like.

47. A charged multiple component, nonwoven filtration media which comprises

a blend of micro-denier/fine-denier blend fibers and coarse-denier fibers, said blend being formed into one or more sheets, said

sheets being multilayered in a graded density structure and needle punched to bond said sheets together, and

a charge treatment applied to said bonded sheets.

48. The media of claim 47 wherein 10-90% of polypropylene or other low melting temperature fibers, including bi-component fibers, are used in a blend to achieve enhanced thermal processing capabilities.

49. The media of claim 47 wherein the charge applied is a cationic or anionic resin.

50. The media of claim 49 wherein the applied cationic resin is polyamide-epichlorohydrin.

51. The media of claim 47 wherein the fabric density, air permeability, and mean pore size can be controlled through heated calendaring and densification of the bonded sheets, including smooth, textured, or patterned calendar rolls.

52. The media of claim 47 wherein the bonded sheets can be formed into flat or curved filter sheets, pleated filters, filter cartridges, filter bags, filter tubes, and the like.

53. A charged multiple component, nonwoven filtration media which comprises

a blend of micro-denier fibers and fine-denier fibers, said blend being formed into one or more sheets, said sheets being multilayered in a graded density structure and needle punched to bond said sheets together, and

a charge treatment applied to said bonded sheets.

54. The media of claim 53 wherein 10-90% of polypropylene or other low melting temperature fibers, including bi-component fibers, are used in a blend to achieve enhanced thermal processing capabilities.

55. The media of claim 53 wherein the charge applied is a cationic or anionic resin.

56. The media of claim 55 wherein the applied cationic resin is polyamide-epichlorohydrin.

57. The media of claim 53 wherein the fabric density, air permeability, and mean pore size can be controlled through heated calendaring and densification of the bonded sheets, including smooth, textured, or patterned calendar rolls.

58. The media of claim 53 wherein the bonded sheets can be formed into flat or curved filter sheets, pleated filters, filter cartridges, filter bags, filter tubes, and the like.

59. A charged multiple component, nonwoven filtration media which comprises

a blend of micro-denier fibers and coarse-denier fibers, said blend being formed into one or more sheets, said sheets being multilayered in a graded density structure and needle punched to bond said sheets together, and

a charge treatment applied to said bonded sheets.

60. The media of claim 59 wherein 10-90% of polypropylene or other low melting temperature fibers, including bi-component fibers, are used in a blend to achieve enhanced thermal processing capabilities.

61. The media of claim 59 wherein the charge applied is a cationic or anionic resin.

62. The media of claim 61 wherein the applied cationic resin is polyamide-epichlorohydrin.

63. The media of claim 59 wherein the fabric density, air permeability, and mean pore size can be controlled through heated calendaring and densification of the bonded sheets, including smooth, textured, or patterned calendar rolls.

64. The media of claim 59 wherein the bonded sheets can be formed into flat or curved filter sheets, pleated filters, filter cartridges, filter bags, filter tubes, and the like.